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THERMOMETER IN ITS DIAGNOSIS.

By T. LAUDER BRUNTON, M.D., LL.D., F.R.C.P., F.R.S.

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(A Lecture delivered at St. Bartholomew's Hospital.)

I PROPOSE to-day to draw your attention to endocarditis, because we have at present a considerable number of cases in the wards, and it is a disease which is of the utmost importance both in itself and as leading afterwards to valvular disease of the heart, with all the consequences of such disease. I daresay many of you may have noticed that there has been an apparent great increase in disease of the heart, but there has been a corresponding decrease in the number of cases of apoplexy. In the Registrar-General's returns for 1838 the deaths from apoplexy were nearly double those from diseases of the circulation, the numbers being 5630 and 3557. In the returns for 1894 the deaths from diseases of the circulation were nearly three times as many as those from apoplexy, the numbers being 46,826 and 16,097 respectively.¹ Fifty years ago, one was constantly hearing of people falling down in the streets, in their offices, or in market places, with apoplexy ;

¹ 1838.

SECOND ANNUAL REPORT OF THE REGISTRAR-GENERAL, ETC., 1840, p. 100.

	M.	F.	Total.
Pericarditis	74	50	124
Aneurism	88	31	114
Other diseases	1870	1449	3319
			3557
Apoplexy	2938	2692	5630

Under diseases of the circulation are included angina pectoris 22, phlebitis 5, fainting 3, abscess of heart 1.

[1894.

but nowadays one hears of comparatively few such cases. Now, I saw what appeared to be a typical case of the old-fashioned apoplexy, a few years ago, in the out-patient room of this Hospital. While I was seeing the patients, the porter informed me that one of the patients waiting outside had suddenly fallen down unconscious. I went into the waiting-room, and there I found the man lying on the floor, with his face purple and his jugular vein swelled up to the size of my forefinger. If I had been an old-fashioned physician, I should have had a lancet in my pocket, and I should have bled him at once, and it occurs to me that possibly I might have done him good: it is just possible I might have saved his life. I did not think of bleeding him, for the reason that the heart had stopped as well as the respiration, and I did not think that any measures I could employ would revive the man. More especially was this the case, because I knew that if a post-mortem were made upon that patient, his brain would have been found to be perfectly free from any blood clot, and it would therefore have been classed by old-fashioned physicians, not as a case of ordinary apoplexy, but as a case of serous apoplexy. For, in former days, men died with symptoms of apoplexy, and a post-mortem examination used to show in many cases no effusion of blood in the brain whatever. Yet, the symptoms being like those caused by apoplexy, the pathologist said that as there was no blood there must be serum, and therefore these were cases of serous apoplexy. But I knew perfectly well, because I had seen this patient for some time before, that what he really was suffering from was aortic regurgitation and aortic obstruction, and that the cause of his death was to be sought for not in the brain but in the heart. Cases of cardiac disease are now very readily recognised by all medical practitioners throughout the country: and so we find cases of sudden death usually recorded as death from the heart, and not, as they formerly would have been, as death from

	1894.	F.	M.
Endocarditic valvular disease		4406	4915
Pericarditis		355	252
Hypertrophy of heart		120	98
Angina pectoris		403	243
Syncope		864	700
Aneurism		660	191
Senile gangrene		681	600
Embolism thrombosis		436	674
Phlebitis		49	76
Varicose veins		35	64
Other and undefined diseases of the heart and circulatory system		14,540	16,464
		<u>22,549</u>	<u>24,277</u>
Apoplexy		7372	8725
Total disease of heart vessels		46,826	
Total apoplexy		<u>16,097</u>	

the brain—as cases of apoplexy. But although actual, well-marked cardiac disease is very readily recognised, it is not so with the cause of cardiac disease—with endocarditis; for this disease may run its course, may cause damage to the valves, may cause death, and yet it may not be recognised.

The first thing that I have to do in regard to this subject is to make a confession, that little more than a month ago I saw a case of endocarditis which I did not recognise, and I will give you a short history of the case, because, as I mentioned to you before, one learns, or ought to learn, perhaps more by mistakes than by success, and it is always best if you can learn from the mistakes of others. This man, E. B., æt. 65, was seen by me in consultation with Dr. Dunbar at Clapham Common, on 3rd October 1896. The old gentleman had been liable to asthma for several years. In July he began to suffer from chilliness, but not very well-marked rigors, and he felt out of sorts, a kind of general seediness

without anything very definite to complain of. He gradually fell off, his colour became bad, his appetite became poor, he lost interest, and he lost strength. There was no cardiac murmur, and there was no swelling anywhere; his temperature was normal. He grew weaker and weaker, and became confined to his bed. When I saw him he had been in bed for several days. His temperature, which was regularly taken by the doctor on his

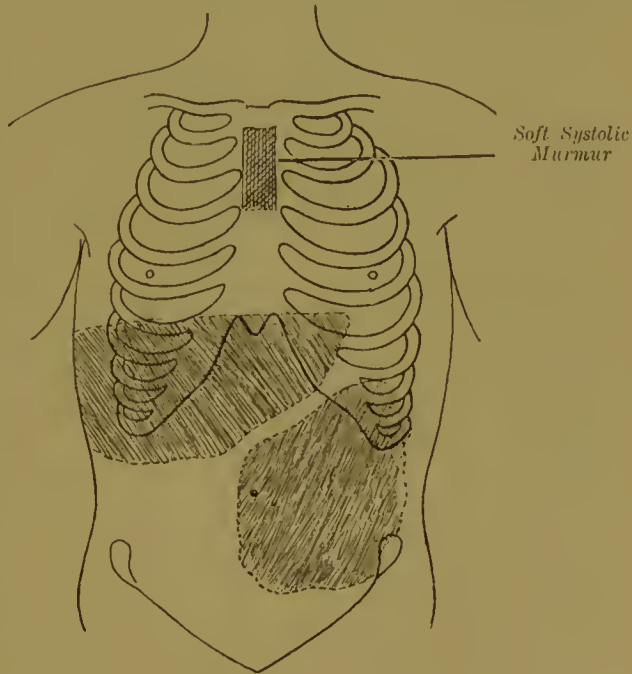


FIG. 1.

morning visit, was always subnormal. The day before I saw him he had been seen in the evening also, and his temperature then ran up to $100^{\circ}4$. On examination, we found a slight systolic murmur over the aorta (I give a diagram showing the spot exactly). We found his liver enlarged; and we discovered a large mass in the abdomen which could be pushed readily aside, and was somewhat soft, nodulated, and rounded. On making the man lie over on his right side, this mass fell readily away towards the right side, and at the same time we could feel that it fell away from the left lumbar region. It moved very slightly on respiration, it was dull

on percussion. The surface, as I have said, was somewhat nodulated, the edge was rounded; there was no distinct notch such as one usually finds in the spleen, and we were able to palpate the abdomen without the least complaint on the part of the patient. He said it felt uncomfortable when he was turned over, and the tumour itself seemed to be slightly tender. The other part of the abdomen, however, showed no tenderness whatever; respiration was perfectly free.

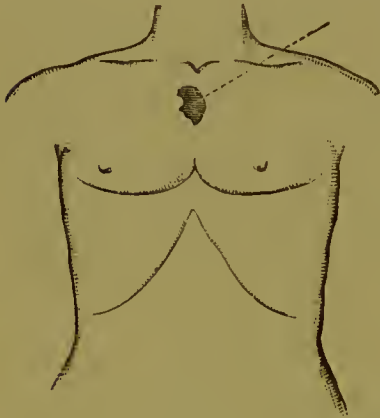


FIG. 2.

My diagnosis was that he had a tumour in the abdomen, which must be starting from close to the left-hand side of the spine behind, because it received an impulse from the diaphragm. It could be felt also in the left lumbar region, so that one end of the tumour was clearly situated in the left lumbar region. It could not be kidney, because it was dull on percussion. It could not, I thought, be spleen, because the surface was unlike that of any spleen I had ever felt. Instead of being

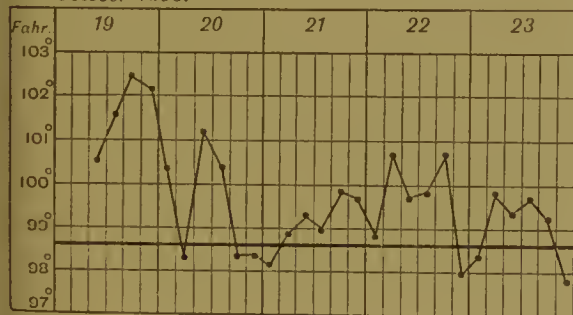
smooth and hard, it was soft, irregular, and somewhat nodulated; there was no sharp edge, as in the spleen, and there was no notch. My diagnosis, therefore, was that it was a tumour starting from the left lumbar region working its way forwards, and that consequently, in all probability, it was a malignant growth. It had increased very rapidly in size within the week or so before I saw it, and this, I thought, added probability to the diagnosis. The slight murmur at the aorta, I thought, was very likely due simply to atheromatous roughness in the aorta. Within twenty-four hours the man died, and a post-mortem was obtained. What was found was this—the tumour, which I supposed to be a new growth, was the spleen, soft and filled with infarcts, and these had come from the aortic valves, which were thickened, rough, and ulcerated. There was also a large amount of peritonitis, although there had been almost no tenderness on palpation. The man was suffering from ulcerative endocarditis with secondary infarcts in his spleen. Here the stethoscope did not help us, and the only thing probably that would have aided us would have been a regular chart of the man's temperature.

In the diagnosis of endocarditis, the thermometer is of as much use, or more use, than the stethoscope. As showing this, I saw a case some years ago in which the temperature ran a course somewhat like that of quotidian ague. There was nothing whatever to be found in the heart by auscultation. I wrote to the doctor, saying that it seemed absurd to think of anything wrong with the heart, for there were no symptoms or physical signs pointing to

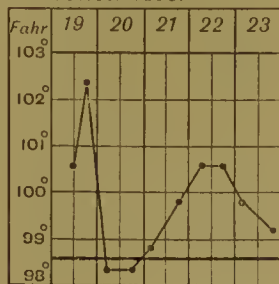
that organ as being either degenerated or diseased. On post-mortem examination, however, we found that the heart was perfectly sound, but the aorta was diseased, and presented an appearance as if one had taken a number of split peas and pasted them over the interior surface of the vessel, and then covered it with red plush. There was warty inflammation of the aorta (*aortitis verrucosa*).

One very important point in the diagnosis of ulcerative endocarditis is to take the temperature, not merely at one time of the day, but at several times of the day; and this is clearly shown by some cases which we have in the wards. The first of these is a boy, J. D., who was admitted under Mr. Butlin for polypus of the rectum. This boy has always been able to run about like other boys at school. He noticed no shortness of breath whatever. He observed that his heart beat rather fast after running, but that is a condition that occurs to anyone however healthy. He was brought into Hospital for this operation; and although there was no symptom indicating disease of the heart, he was examined all over in the ordinary way. By this method of routine investigation, it was discovered that he had two murmurs at the heart, both systolic in time; one at the apex, and another at the base. The operation was performed under cocaine, and I was asked to see the boy, whose temperature had run up to 102° the night before the operation. On examining the boy, I found well-marked murmurs of the kind I have just mentioned, indicating mitral regurgitation and aortic obstruction, but the heart was not hypertrophied. Now, if these symptoms had been of long standing, the heart would almost certainly have been hypertrophied, but the absence of hypertrophy appeared to indicate that the boy was suffering from recent disease which had not yet lasted so long as to induce hypertrophy. I therefore said

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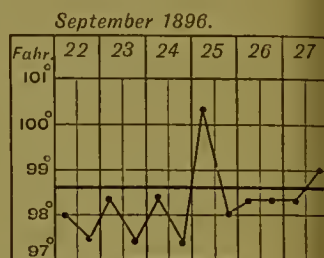
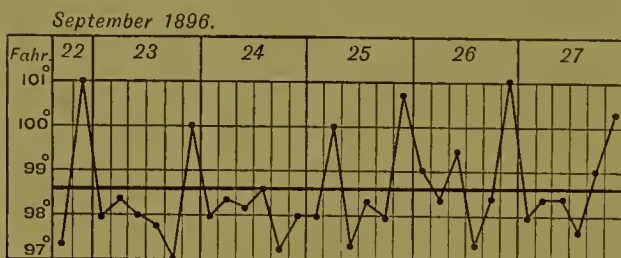


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we would take him into Rahere Ward, and keep him there until the disease passed over, because I felt sure that he was not at the end of an illness, but at the beginning of one, and we would very probably have to keep him in for some time. Looking at the charts, there are some days in which a rise of temperature does not occur in the ordinary daily chart, when the temperature

is taken morning and night. On the 20th of October, for example, the four-hours' chart showed that the temperature had run up to 102° , but in the daily chart there is no rise whatever. The temperature had risen and fallen between the times when the temperature was taken in the morning and taken at night. We have this again, perhaps, still more markedly in the case of M. H., where upon many occasions the temperature ran up in such a way as to be shown very markedly upon the four-hours' chart, but not shown at all in the daily chart. In the case of M. H. also, the necessity for routine examination of the heart became



very evident, because, while the child was lying in bed apparently protected from injurious influences, the disease in the heart, without any warning, or any indication, became progressive, and she developed inflammation of her aortic valves, resulting in regurgitation, which was only detected by the routine habit of examining the patient in a pretty thorough way once a week at least.

The nature of endocarditis is, that it is an inflammation which, like other inflammations, may be simply due to some irritant substance which is not organised, or it may be due to some organised microbe. Most of you know that, many years ago, Sir B. W. Richardson stated that, by the injection of lactic acid into the veins, he was able to produce endocarditis, resembling in its phenomena the endocarditis which occurs so frequently in the course of acute rheumatism, but these experiments have been repeated with varying results. One man, Ruth, said that he was able completely to confirm them, for on the injection of diluted lactic acid, either into the abdominal cavity or into the jugular vein, the pulsations of the heart in the animals experimented upon at once rose by quite one-third. The sounds in the heart became altered, and, when the animals were killed eight hours afterwards, vegetations were found upon the valves; these vegetations being of the nature of a semi-gelatinous exudation adhering to the valves. Others have repeated the experiments and not found the same results: and one observer stated that he found certainly vegetations on the valves, but that he found those vegetations in animals which had received no lactic acid whatever. So the question of the origin of endocarditis from simple chemical substances of an irritant nature is still *sub judice*. There is, however, no doubt that in most cases of endocarditis organisms are present, and these

organisms are of very varying characters. It is not one organism alone, but organisms of many different kinds. They are chiefly cocci. There is the *Staphylococcus pyogenes aureus* growing in groups; the *Streptococcus pyogenes* and the *Diplococcus pneumoniae*. These are the three chief, and we may put the *Diplococcus pneumoniae* upon one side to a certain extent, as not being what we may call a pure cause of endocarditis. But, associated with these, we have a very large number of varying organisms, some bacilli, some cocci; so that in most cases of endocarditis the infection is not a pure one. There are generally not one kind of coccus only, but several kinds of cocci together, and from the fact that these different cocci are present, in varying proportions and in varying numbers, one would naturally expect that the symptoms of endocarditis would vary a good deal, and so they do. They vary very much, both in their nature, in their intensity, in their duration, and in the consequences which they produce. Now, these organisms, when taken from the valves in a case of ulcerative endocarditis, and cultivated, may be injected into veins of animals with varying results. Sometimes they produce no result whatever; sometimes they produce, even in apparently healthy animals, inflammation of the valves. But if the valves of the aorta have been previously injured by running a needle down through the carotid, so as to cut a little tissue or scratch the valves, they become almost certainly affected by ulcerative endocarditis if the cultivations of these organisms be subsequently injected into one of the veins. It would seem that, although these organisms have not always the power of attacking healthy tissue, they have the power of attacking diseased or injured tissue. Another evidence of such a power as this, you may remember, was noticed very markedly by Chauveau. In the south of France the mode of castrating horses is to twist the testicles until they become necrosed. The blood supply is stopped by the twisting of the arteries, and by and by they simply atrophy without becoming inflamed, or without any pus forming. If a cultivation of some microbes is injected into the jugular vein, such a cultivation would produce no result in a healthy horse, but it would at once attack the testicles which have been injured in this way. The results which are found on the valves vary, as I have said, very much in extent, and they may be said to differ also in kind. You will often notice that on the valves there are vegetations forming. These may form alone, but generally they tend to ulcerate, and often, when there is extensive ulceration, we find vegetations as well: just as in any case of ulceration we find as a rule what is termed "proud flesh" coming up around the edges of the ulcer. Therefore, as a rule, ulceration and the formation of vegetations go hand in hand, and we may find either the one or the other taking the upper hand.

These vegetations frequently consist to a great extent simply of

fibrinous accretions on the valve. If you take some fresh blood and whip it with some round twigs or a piece of stick, you find that the fibrin aggregates and forms a thick coating round the ends of the twigs or piece of stick. The same process is carried on in the living body by the roughened valves. The valves, when healthy, clear, and smooth, do not tend to cause fibrin to separate from the blood, but if roughened and ulcerated they tend to cause the fibrin to be separated from the blood, and so we get little knots of fibrin upon the inflamed parts. These excrescences may to a certain extent become infiltrated also with the microbes, and they may separate and be carried on by the blood stream, as little fibrinous knots either without microbes or with microbes. According to the number of microbes contained, the greater will be the tendency for them to produce infection at the point where they are stopped by the narrowing of the vessel through which they are being carried on by the blood stream. They may go to any part of the body; to the brain, to the kidneys, to the liver, or to the spleen, and there they seem to produce inflammation. I see the time is passing on very quickly, so I shall now say a word or two only about the diagnosis.

The nature of the diagnosis to a great extent depends upon the thermometer. If you find a murmur at the heart, or even in cases where you find no murmur at the heart, if you find a temperature which runs a course very much like that of quotidian ague, in a case where you can trace no malaria and where you can find no indication of suppuration, it is very likely indeed to be a case of endocarditis. I will just allude to another case which impressed itself very much upon me, both in regard to the diagnosis, prognosis, and treatment, because it was one of the first cases in which the disease was brought prominently under my notice. This was a boy, F. G., æt. 15½. He was the son of a medical man in London. He was brought to me on 29th October 1887, on account of weakness, languor, and slight rheumatic swelling of the right hand, as well as some enlargement of the liver. On examination, I found that the boy had enlarged liver, as his father had said. I found, however, in addition to this, that the heart was considerably hypertrophied, and that there was a systolic murmur at the apex, indicating mitral regurgitation. I told this to the father, who was very much astonished, as he had examined him very carefully all over, and had never found anything indicating disease of the heart. My diagnosis was that the boy had endocarditis, leading to disease of the valves and mitral regurgitation; but I said, "I think he is over it; his temperature is now perfectly normal." This was at ten o'clock in the morning. A day or two afterwards, his father wrote to me to say that the boy was not over it. The boy was not feeling at all well, and the temperature was going up in the afternoon. After that the boy's liver became

more tender; he next had pleurisy of the right side; his right knee, which was somewhat swelled when I saw him, became larger. He then developed pericarditis, and after that left-sided pleurisy. With all these together, the father and I thought there was no chance for the boy. We believed he might get round till left-sided pleurisy set in, but with all this complication and the disease progressing, what was going to become of him? I said, "I do not think that he can get well." The father said, "I do not believe there is any chance." Then the father said, "Let us get Sir Andrew Clarke, because he may, perhaps, make some suggestion. It can do no harm, perhaps it may do good." Sir Andrew Clarke was called in, and he said, "I do not think the boy need necessarily die. I have seen other cases like this that recovered. I do not know whether they recovered because they took benzoate of soda, but they were taking this drug when they got well." We therefore put him on benzoate of soda, 20 grs. every two hours. Whether it was the benzoate of soda or not, I cannot tell, but that boy got well, though he still retained the mitral murmur. He was well enough to go to school, and afterwards to college; but I do not know whether he is still alive, as I have not heard of him for some years. We have tried some of these cases with benzoate of soda, and I do not know that there has been any very marked results from it. One thing we have noted is, that the child in one case came out in a rash, but a lot of the others came out in a rash, even when they were not taking benzoate of soda, and a rash is very often to be found in cases of ulcerative endocarditis.

There is one point more which I must just touch upon, and that is the causation of this disease. Most of you know the old rhyme—

"He who drinks strong beer, and goes to bed mellow,
Lives as he ought to live, lives as he ought to live,
And dies a jolly fellow.

He who drinks small beer, and goes to bed sober,
Falls as the leaf falls, falls as the leaf falls,
And dies in October."

Now, I rather fancy that at the time that these rhymes were composed the man who drank small beer did not do it of his own free will, but that he probably drank it because he was compelled to, and that the same smallness of funds that compelled him to drink small beer, also compelled him to be content with scanty fare; or if he happened to be a rich man, it was evident that he tended to save his money, and he probably saved it both in the beer and upon the bacon. So that in either way he probably was of a feebler physique than the man who drank strong beer. But why should he die in October? Now, it has struck me very much that this disease—endocarditis—is much

more liable to come on at the time when the leaf falls, and I have come to this conclusion from seeing a number of cases. One day I was a good deal interested in what seemed a great corroboration of my idea. It was on the 27th of November 1893. I saw a boy, B. M., æt. about 12, in consultation with Dr. Bezly Thorne. His illness began three weeks before I saw him, so that it was not in October, but it was just at the very beginning of November. In him I found that there was a distinct evidence of mitral disease, and there was a raised temperature, indicating fresh inflammation of his heart; there was no inflammation of his joints. I asked where he had been when the illness came on, and was informed that he had been in the country. I inquired about dead leaves. "No," said his mother, "there are trees about, but they are all pine trees, and there are no leaves at all about." So, I thought, here's a death-blow to my theory. I went down with Dr. Thorne to the drawing-room, and while we were discussing the treatment of the patient, the child's mother came down and said: "I have just been making inquiries, and find there were a lot of beech trees about the house, which I was not aware of, and the day before we left the country the boy was helping the gardener to sweep up the beech leaves, putting them in a wheelbarrow and carrying them into the garden." Whether this was the cause of his endocarditis or not I cannot say, but I have a strong belief that it is advisable for delicate people to avoid fallen leaves as much as they can. I do not know whether these cocci or bacilli grow well on the decayed leaves, but it is quite likely that they may. We know that several varieties of low organisms do thrive well upon decaying vegetation, and it is quite possible that some of those may have something to do with the origination of endocarditis; but how were they to get in? Well, these cocci apparently get into the organism through very small channels, and sometimes without producing any marked symptoms at the point where they enter. In some cases it is quite possible that they enter through the lungs, and it may have been so with this boy. In other cases they enter through any small wounds. In one case that I lately saw, I am inclined to think that the channel of entrance was decayed teeth, or rather inflamed gums, with formation of pus about the roots of the teeth.

Shortly, then—(1) Endocarditis is a disease of the utmost importance in regard to its present consequences, namely, death at the time; to its future consequences, namely, disease of the heart. (2) It is difficult to recognise, because, sometimes, we do not look sufficiently carefully for it, either by means of the stethoscope or by means of the thermometer. (3) When we are using the thermometer, we must use it more frequently than we would do in ordinary cases; and that while we generally do not in a case of ordinary typhoid take the temperature oftener than morning and night, yet in doubtful cases of typhoid it is well to take it every

four hours, lest the supposed typhoid might happen to be a case of endocarditis. For not unfrequently cases of endocarditis are really mistaken for typhoid, and they have been admitted into hospitals under this supposition.

As regards the treatment of cases, it is necessary to keep the patient perfectly quiet, because, otherwise, the cardiac mischief will develop more; the valves will probably become more implicated, and it is almost certain that the muscular fibres of the ventricles will yield to the strain. The exact drug that should be employed I do not know. Benzoate of soda I have tried a good many times; sometimes I have given also salicylate of soda, sometimes the perchloride of mercury, and sometimes I have prescribed oil of eucalyptus. From oil of eucalyptus I have thought I have secured distinct benefit, and I gave it because it seemed to be a drug that would act as a germicide, without doing much harm to the patient; but in none of those drugs can absolute reliance be placed.



